

Open Research Online

The Open University's repository of research publications
and other research outputs

Networked learning and digital technology

Conference or Workshop Item

How to cite:

Jones, Chris (2012). Networked learning and digital technology. In: 8th International Conference on Networked Learning 2012, 02-04 Apr 2012, Maastricht, Netherlands.

For guidance on citations see [FAQs](#).

© 2012 Chris Jones

Version: Version of Record

Link(s) to article on publisher's website:

<http://www.networkedlearningconference.org.uk/abstracts/pdf/jones.pdf>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

Networked Learning and digital technology

Chris Jones

The Institute of Educational Technology, The Open University, UK. c.r.jones@open.ac.uk

Abstract

Networked learning has been defined in the Networked Learning conference series as being based on the use of Information and Communication Technology. The term networked learning acknowledges one aspect of this relationship to computing and to networked computing in particular. This paper explores the relationship of networked learning to technology using an alternative characterisation of new technologies, the term digital, and asks what kinds of implications the digital nature of current technologies have for networked learning. The paper explores the idea of technology and suggests that the term can be used in a number of different ways. It suggests that digital technologies are complex technologies that imply a degree of modularity and recursiveness. The paper suggests that in learning technology digital technology is usually met as part of an infrastructure, understood as a sociotechnical system. The paper argues that despite this complexity there are analytically discernable features of digital technologies that can be thought of as affordances.

Using two lenses the paper examines current usage of the idea of the digital in terms of digital natives and digital literacy (-ies) and argues that both ideas are inclined towards technologically determinist outlooks. The paper also notes the particular feature of rapid change in relation to digital technologies and how the nature of the evolution of digital technology relates to digital literacy. The paper concludes by suggesting that research into networked learning needs to take the nature of the digital seriously. A more detailed understanding needs to be developed of what kinds of affordances digital technologies make available. These need to take into account the different meanings of technology and encompass the purposes of digital technologies, the ways they are arranged in assemblages and the way they present themselves as an entire collection of devices in a culture. If insufficient attention is paid to the digital bedrock of technologies then determinist readings of the effects of technology that are based on accounts that are uncritical and lacking in any detailed understanding of digital technologies will prevail.

Keywords

Technology, digital technology, networked learning, affordance, digital native, digital literacy, agency

Introduction

Technology is a term that has several meanings yet it is used, without any major communication problems in a wide variety of contexts. Arthur argues that technology has 'at least half-a-dozen major meanings' and perhaps just as importantly that some of these meanings conflict (Arthur 2009 p5). He goes on to explore three definitions that he uses throughout his book to explore the nature of technology. Arthur argues that we require these three definitions because they point to different categories and that each category has its own origins and evolution. The definitions are:

- 1 Technology as a means to fulfil a human purpose
- 2 Technology as an assemblage of practices and components
- 3 Technology as the entire collection of devices and engineering practices available to a culture. (Arthur 2009 p28 emphasis in original)

In relation to educational or learning technologies each of these definitions has its place. The very common form of thinking about technology as a tool fits clearly into the first definition in which technology has a function and it applies both to devices and to software and even to methods and processes. We can talk about Moodle as a technology, Virtual Learning Environment (LMS/CMS) as a technology and even generically about 'learning technology'. All of these make sense viewed in terms of function and purpose. As we move away from singular

devices and applications with their own particular purposes the idea of technology as an assemblage becomes more apparent. When we discuss networked learning and the technologies that support this kind of educational system the devices and applications are many and often composite and the human processes, practices and procedures that enable the technology in use are complex. Technology in this sense cannot be reduced to a singular purpose and is always a complex system. The final sense of technology captured by Arthur's definitions points to the macro system and structure in which learning technology is embedded, the networked society described by Castells (1996) with all its technological richness and dynamism, and within which networked learning takes place. Selwyn for example, uses digital technology to allude to " the ongoing digitisation of culture, politics, economics and society that can be associated with such technologies - what can be termed the 'digital age' for want of a better label " (Selwyn 2010 p6)

Arthur suggests that technology, whether digital or not, is usually a composite of several components and that only simple and basic technologies are composed of a single part. Usually complex technologies are modular in structure, composed of sub-assemblies, in something resembling a human division of labour. This modularity of structure for complex technologies leads Arthur to claim that technologies are recursive, that each technology is in turn, composed of other technologies that form sub-assemblies and that this process goes all the way down to their elemental parts. This recursive structure leads Arthur to argue that technologies constantly evolve and change, and that new technologies are generally assemblies of other older technologies. This view of an evolving complex system is contrasted with the standard view of technologies which conceives of technology in terms of stand alone fixed structures that are only subject to occasional innovation (Arthur 2009 Ch2). If we examine the history of networked learning we can see this recursive structure and the evolutionary process in play in relation to learning technologies. The earliest networked learning platforms were Internet based and predated the Web. Books such as *Learning Networks* were published in the mid 1990s, just as the Web was emerging and they were based on the experience of computer based conferencing systems that did not rely on hyper text transfer protocol (http) for their operation and used remote log-in (Telnet) and file transfer (FTP) (Harasim et al 1995). The current generation of VLEs (LMS) still include components found in these previous technologies e.g. the threaded discussions in Moodle Forums.

Networked learning is based on the availability of technologies thought of as more than simple technological tools and it can be said to rely on two kinds of technological infrastructure. Infrastructures are often conceived of as ready-to-use, completely transparent and not requiring consideration such as the water system, the electricity supply, mail services and more recently the Internet. As such infrastructures are socio-technical systems reliant on complex organisational practices for maintenance and for making the infrastructure meaningful (Edwards 2003). Infrastructures though often out of sight come into sharp focus when they fail. In networked learning a distinction can be made between technologies that are firstly part of an 'infrastructure for learning', that is technologies designed to or assigned to support learning (Guribye and Lindström 2009), and secondly technologies that are universal service infrastructures (Hanseth and Lundberg 2001). Infrastructures for learning would include Virtual Learning Environments (Learning Management Systems) such as Moodle, but they would also include blogs supplied externally, and widely available beyond any institution, such as those supplied by Wordpress, when they are enrolled in a learning process. Infrastructures for learning would also include cloud services such as Google Apps, when they become part of an institutional offering. Universal service infrastructures are those infrastructures that may support learning but stand outside of any institutional provision, for example Wikipedia and Google (Search, Scholar, Books etc). In this way digital technologies do not appear directly in networked learning but rather networked learning engages with digital technologies as parts of infrastructures that are complex socio-technical systems.

Digital technologies

Just as technology is used in a variety of ways with potentially conflicting meanings, so too is the term digital technology. Digital technology most clearly relates to Arthur's third definition of technology as an entire collection of devices and engineering practices available to a culture, though digital technology can be applied to singular devices such as cameras and also to assemblages that form part of learning infrastructures such as a VLE/LMS. Arguably digital technologies pervade and potentially define the age in which we live. At root digital technologies are those technologies that use discrete (distinct/separate) numbers as opposed to analogue devices which rely on continuously variable data. While computing can be analogue in form, 'digital' has come to stand for modern day computing which relies on digital processing. Naturally occurring phenomena are generally analogue in form and for information to be input and processed by digital computers the natural phenomena have to go through a process of digitisation. Images, sound and text can all be rendered into a series

of 0s and 1s, a binary code that allows computers to process and communicate the information in a variety of ways. Prior to the use of digital, at a time when technologies were split between analogue and digital forms, electronic and 'e' were used to point to the modern forms of information and communication in such terms as electronic media and e-learning. Both electronic and digital are terms that try to capture aspects of long-term change in technology and wide scale influences or impacts. Literature related to learning technology not only refers to digital technologies as a distinct and understandable category but it also links these technologies with quite definite effects. Young students are discussed using the term digital natives (Prensky 2001, 2011, Palfrey and Gasser 2008, 2011) and the capacities of students in relation to technology are described in terms of digital literacy (ies) (Beetham et al 2009, Goodfellow 2010). In some part this is the consequence of a persistent technological determinism found in the learning technology literature (Oliver 2011) and especially in these debates using the idea of digital technologies (Jones 2011). Technological determinism suggests that change arises in technology as a separate sphere and then acts independently having impacts on other dependant domains in society. Digital technology is seen as an external force with some definite and known characteristics that impact on education and learning.

Boyd writing in the context of social network sites has suggested that four properties arise out of the digital nature of network technologies:

- Persistence: Online expressions are automatically recorded and archived.
- Replicability: Content made out of bits can be duplicated.
- Scalability: The potential visibility of content in networked publics is great
- Searchability: Content in networked publics can be accessed through searching. (boyd 2010)

While this list is not exhaustive it provides a starting point for thinking about the specifically digital affordances of technology. Affordance is a contested term but it is useful in this context as it identifies those, relatively stable features of digital technology that when mobilised enable things to be done with relative ease. (For discussion of the use of the term affordance see Oliver 2011, Dirckinck-Holmfeld and Jones 2009, Derry 2007). Unlike Oliver I do not hold the view that affordance slides into a form of technological determinism. A socio-cultural perspective on affordance would suggest that the human ability to perceive and act cannot be separated from particular social and cultural contexts and that what is afforded in one context will not necessary be afforded in another. From this standpoint perception is integrated into human interaction with the world and is mediated socially and culturally through learning. I argue that affordances can be identified in the environment, and in this case affordances associated with digital technologies, which are both analytically available and relational to humans as living creatures. How a human being perceives and acts on such affordances remains dependant on understandings and prior knowledge, including acquired ways of interpreting and acting on affordances based on cultural and social experience.

Jones and Dirckinck-Holmfeld (2009) have separately tried to capture the affordances of digital technologies specifically in relation to networked learning:

- Time shifts – Computer networks used in education affect the usual time patterns of education. Many courses delivered across networks are asynchronous.
- Place – The introduction of mobile and ubiquitous computing devices have begun to make the idea of education occurring at anytime, anyplace, and anywhere seem more feasible.
- Digital preservation – The outputs of synchronous and asynchronous activity are easily preserved in transcripts, logs and a variety of other forms including the archiving of web casts and audio interviews/podcasts.
- Public/Private boundaries – The preservation of what would otherwise be ephemeral materials alters the boundaries between what is public and what is private. Tutors can now view and preserve the details of student's interactions during group activities, making these available as tools for assessment.
- Forms of literacy – The still largely text based world of networked learning has generated new forms of writing that are neither simple text replications of informal conversation nor are they formal written texts. The integration of images and audio into digital environments has suggested new forms of multimedia literacy.
- Content – The boundary between content and process is shifting. Blogs and wikis can provide elements of content and cut and paste re-use is common practice. The idea that there is a clear distinction between activity/process and artefact/ content is becoming strained. (Jones and Dirckinck-Holmfeld 2009 p10)

The important feature of both lists is that of relative stability in relation to the constantly changing technological context. Many of these features were identified in the early years of networked learning using the Internet (see for example Harasim et al. 1995). If digital technologies have relatively stable and discernable features how do these features help shape participation in networked learning? In particular this paper will explore the implications of digital technology using two lenses:

- the idea of young people as digital natives and
- the idea of digital literacy.

Both usages assume that digital technology has a largely unproblematic set of characteristics and that these can lead directly to definite effects.

Digital Natives

In 2001 the term ‘Digital Natives’ was introduced to describe ‘native speakers’ of the digital language of computers and the Internet (Prensky 2001a, 2001b). Digital Natives were described as being distinct from previous generations because they had developed new attitudes, aptitudes, and approaches to learning. Prensky argued that there had been a sharp generational step change:

A really big discontinuity has taken place. One might even call it a “singularity” – an event which changes things so fundamentally that there is absolutely no going back.... (Prensky 2001a p 1)

In contrast to ‘Digital Natives’, those who were not born into the digital world and had to adapt to the new technologies later in life, were called ‘Digital Immigrants’ (Prensky, 2001a). No matter how well Digital Immigrants adapted to the new environment, Prensky claimed that they would retain their ‘digital immigrant accent’. Prensky expressed concern about the profound gap he identified between Digital Native students which he thought were incompatible with the teaching practice of their teachers who would need to change their teaching approaches to meet the needs of the new generation of learners (Prensky, 2001a).

The causative mechanism was the general immersion of the generation in digital technologies;

They have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age. Today’s average college grads have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games (not to mention 20,000 hours watching TV). Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives.

It is now clear that as a result of this ubiquitous environment and the sheer volume of their interaction with it, today’s students think and process information fundamentally differently from their predecessors. (Prensky 2001a p 1)

This argument assumes that digital technologies, while listed separately, have general effects. These effects are described as being deep seated changes in ways of thinking and processing information. In this way Prensky developed a determinist argument that suggested that technological change led automatically to a sharp change in generational characteristics and to a new generation of students.

Palfrey and Gasser in their book *Born Digital* (2008) mounted the most sustained attempt to reclaim the term Digital Native as a useful academic label. Palfrey and Gasser argued that the term generation was an overstatement and preferred to call the new cohort of young people a ‘population’ (2008 p14). However their arguments lead to some confusion. Firstly they identified the Digital Native population by their access to technology. By doing this the group of Digital Natives becomes narrower because access to digital technologies varies between different social classes and between different countries and geographic regions. Palfrey and Gasser also note that in order to be able to access to digital technologies users have to acquire a degree of digital literacy. Given these qualifications it is clear that the original argument presented by Prensky that digital technologies give rise to an entire new generation leaves a lot to be desired. Palfrey and Gasser have moved from a generational argument to describe a sub-group within a generation of young people, a population who depend on:

- Access to digital technology
- Digital literacy that can only be acquired through some form of informal or formal learning.

The attempt to re-claim the term Digital Native has significant weaknesses and it is not clear what benefit remains in retaining the term Digital Native and the idea of a generational change needs to be abandoned.

Recognizing that the Digital Native/ Digital Immigrant distinction might be less relevant Prensky (2009) has proposed a revision of his original argument based on the term 'digital wisdom'.

Although many have found the terms useful, as we move further into the 21st century when all will have grown up in the era of digital technology, the distinction between digital natives and digital immigrants will become less relevant. Clearly, as we work to create and improve the future, we need to imagine a new set of distinctions. I suggest we think in terms of digital wisdom. (Prensky 2009 p 1)

Unlike the Digital Native-Immigrant divide all can acquire digital wisdom through their interaction with digital technology. Everyone is able to move towards digital enhancement because Prensky has reduced the divide he previously identified between Natives and Immigrants. However Prensky retains a modified form of the claim that use of digital technologies changes the brain of the user and his revised position remains deterministic. Prensky's has simply moved from a hard form of technological determinism, in which technology has created the divide between Natives and Immigrants, to a softer form of determinism in which digital enhancement is necessary for everyone if they are to succeed.

At the level of the student there is no evidence of clear or consistent demands from students for changes to pedagogy (e.g. demands for team and group working). Digital technologies are being taken up by young people most prominently, even though their use is patterned by factors other than age and shows no sharp generational divide from older people (Jones 2011, Jones 2012, Hargittai 2010, Kennedy et al 2010). There may be good reasons for teachers and universities to revise their approaches to teaching and learning and to introduce new ways of working but students are not forcing these changes. Evidence shows that students will respond positively to changes in teaching and learning strategies if they are well conceived, well explained and properly embedded in courses and degree programmes. However there is no automatic link between apparent features of digital technologies, such as the possibility of greater participation and demands from students for greater collaboration. A second feature of digital technologies is the pace of change. The Harvard focused The facebook was launched in 2004 and the public version, Facebook, in 2006. Social networking sites were barely on the horizon when the Net Generation and Digital Native literature became popular and this feature points to the evolutionary nature of technological innovation described by Arthur (2009). The complex picture emerging from empirical studies of young students shows differences between students within the Digital Native age range and these differences are most marked in relation to the newer technologies (Jones et al. 2010).

Jones (2011) has argued that there are two different kinds of argument that link students and young people with changes in technology.

- the ubiquitous nature of certain technologies, specifically gaming and the Web, has affected the outlook of an entire age cohort in advanced economies.
- The new technologies emerging with this generation have particular characteristics that afford certain types of social engagement. (Jones 2011)

The first argument is the one most associated with the idea of Digital Natives and Jones suggests that it is this argument that needs to abandon in the face of the empirical evidence (see also Jones 2012). The second argument that new technologies allow for or afford new types of social engagement should be developed because it suggests that digital technologies have a causative role but not a determining role by presenting a range of possibilities and choices at all levels of networked learning.

If digital technologies simply present affordances that may or may not be taken-up then teachers and institutions can have a clear role in selecting appropriate technologies in relation to pedagogy and the demands of the subject or disciplinary area in which they teach. They also have a role in developing a deeper level of engagement with digital technology for educational purposes than can be found spontaneously amongst students. To make such choices educators will need to develop a deeper understanding of the educational affordances of digital technologies and how they could be used to facilitate a range of teaching and learning practices. Achieving this would require an engagement with the educational rationale for the deployment of digital technologies, an active participation in experimentation, and evaluation of the effectiveness of particular digital technologies in practice. Overall the argument presented here is that while digital technologies have stable features that can usefully be described in terms of affordances these features do not lead to a hard or soft

determinism and inevitable outcomes. Rather the affordances of digital technologies open up a range of choices for educators, institutions and governments that need to be made more explicit.

Digital Literacy (-ies)

The term digital literacy is used in a variety of mundane ways. For example Microsoft provide a set of courses under the banner of digital literacy:

The Basic curriculum features a course called A First Course Toward Digital Literacy. This course teaches absolute beginners to computing about what a valuable tool computers can be in society today, and the basics of using the mouse and the keyboard. The interactive, hands-on lessons will help novices feel comfortable manipulating the mouse and typing on the keyboard.
<http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp>

This is a common sense use of digital literacy and it focuses on the capacity to access and use information mediated through digital channels. Digital literacy thought of in this way is limited to notions of individual skill and competence and it would involve the training of staff and students in ways to use digital tools and communication systems. This is similar to the way in which Palfrey and Gasser (2011) use the term when they talk in terms of a participation gap between those who have different levels of skills. The examples they provide are - being able to sort the more credible from less credible sources of information online; sharing only what you mean to share about yourself and avoiding violating the intellectual property of others. The agenda is clearly a skills agenda with the intention of teaching the requisite skills to those who do not currently possess them.

Beetham et al. (2009) introduce their report on learning literacies with this distinction:

The phrase digital literacies or literacies for a digital age expresses a tension between two points of view:

- education needs to carry on doing much what it has always done (literacy as a generic capacity for thinking, communicating ideas, and intellectual work)
- education needs to change fundamentally (digital technologies and networks as transforming what it means to work, think, communicate and learn). (Beetham et al. 2009 p8)

The author would not agree with either of these points of view because changes are taking place in education based not on what technology forces education to do but on what it allows education to be. It is not necessary to believe that education has to change fundamentally to believe that education cannot simply carry on doing what it has done previously. However this distinction has some echoes with that made previously with regard to Digital Natives, indeed the second point of view corresponds with views expressed by the main advocates of the Digital Native thesis (see for example Prensky 2010).

For academics working in the field of New Literacy Studies (NLS) literacy is thought of in terms of a set of changing communication practices and literacy practices are viewed as the constructions of specified social groups and knowledge a social accomplishment. While NLS focused on the contextual nature of communication practices in general more recent developments have applied this approach to digital technologies (see Mills 2010 and Goodfellow 2010). Mills for example comments that:

The most recent, significant shift in this field has been what could be called the “digital turn”—that is, the increased attention to new literacy practices in digital environments across a variety of social contexts, such as workplaces and educational, economic, and recreational sites. (Mills 2010 pp246-7)

This sense of digital literacies, understood as a set of practices, can be developed in relation to the affordances of digital technology. Practices about managing the boundaries between public and private, dealing with the persistence and searchability of digital communications are not inevitable outcomes of engagement with new technology and the way these practices emerge and develop needs to be understood as more than the acquisition of a simple skill.

The idea of digital literacy is made more complex by the rapidly changing nature of digital technologies. Dron has argued that the rapidly increasing complexity of digital technologies has the apparently contradictory effect of reducing the complexity for the end user (Dron 2011). He argues that even if it was possible to isolate a range of literacies related to digital technologies they would become increasingly invisible as the trend to making devices easy to use continues. The contrast would be between interactions with a 1980s command line computer interface before WISYWIG and interaction now via a touch screen on a smartphone or tablet computer. The argument that Dron makes is that effort needs to go into the technologies we use, making literacy with computers largely irrelevant rather than putting effort into learning a literacy that is almost certain to be transient.

Discussion and concluding remarks

The argument of this paper has been two fold. Firstly that digital technologies have discernable and relatively stable (but not fixed) characteristics and secondly that we cannot read directly from these characteristics to inevitable outcomes in terms of effects. The discussion of technology by Arthur suggests that technology can be understood in a variety of ways and some of these may be contradictory (2009). This variation in understanding and the potential for contradiction also apply to digital technology. There is no simple way to derive a detailed or comprehensive list of the features of digital technologies that may provide affordances to users. However some attempt to develop such a mapping may be necessary. Primarily to ensure that digital technologies are considered as more than individual tools. Much research investigates the potentials or effects of particular technologies or devices such as blogs, wikis or mobile technology (often understood only as handheld devices). Technology also needs to be understood at a more general level, in terms of a broad cultural influence, and as the basis of infrastructures which have a sociotechnical character. This intermediate layer of technology in general also needs to be distinguished from digital technology understood as defining an epoch or age (see for example Selwyn 2010).

In suggesting that research into networked learning needs to take the nature of the digital seriously I am suggesting that a more detailed understanding needs to be developed of what kinds of affordances digital technologies make available. The list provided by boyd in relation to social networking (2010) and that provided by Dirckinck-Holmfeld and Jones (2009) in relation to networked learning are starting points but they are not sufficient. Any description of the affordances of digital technology will need to take into account the different meanings of technology. This will mean that a description of affordances will need to encompass:

- the purposes of digital technologies,
- the way they are arranged in assemblages and
- the way they present as an entire collection of devices in a culture.

The first level of description would cover particular tools and devices, with exact or specific purposes in mind, for example the affordances and use of e-book readers, blogs or wikis in particular contexts. The second level would refer to areas of infrastructure, such as university VLEs (LMS) or online library services, which have multiple purposes and are applied across a range of contexts. Whereas the final level would encompass broad social phenomena such as the widespread adoption of social networking sites and the relevance of a cut and paste culture to attitudes towards plagiarism. The intention would be to add a greater degree of precision to the way 'digital' technology is described and to feed that level of precision into future (empirical) research agendas. If insufficient attention is paid to the detailed description of the affordances of digital technologies then the kinds of determinist readings of the effects of technology found in Digital Native and digital literacy discourses are likely to persist. Even though they are based on accounts that are uncritical, and lacking in any detailed understanding of digital technologies, they form part of a discourse of the powerful that has the ears of policy makers. At a time of economic retrenchment policy makers will be searching for easy answers and quick solutions that offer value for money. Without a critical discourse around the nature and uses of digital technology such pressures are likely to go unchallenged and affect the potential for networked learning.

References

- Arthur, W.B. (2009). *The Nature of Technology: What it is and how it evolves*. London: Allen Lane.
- Beetham, H., McGill, L., Littlejohn, A. (2009). *Thriving in the 21st century: Learning Literacies for the Digital Age* (LLiDA project), The Caledonian Academy, Glasgow Caledonian University for JISC.
<http://www.academy.gcal.ac.uk/llida/outputs.html> [Viewed 5th Oct 2011]

- boyd, d. (2010). Social Networking Sites as Networked Publics: Affordances, Dynamics and Implications. In Z. Papacharissi. *A Networked Self: Identity Community and Culture on Social Network Sites*. New York: Routledge.
- Castells, M. (1996). *The Rise of the Network Society*. Oxford, UK, Blackwell Publishers.
- Derry, J. (2007). Epistemological and conceptual resources for the development of learning technologies. *Journal of Computer Assisted Learning*. Vol 23, 503-510.
- Dirckinck-Holmfeld, L., and Jones, C. (2009). Issues and Concepts in Networked Learning: Analysis and the future of networked learning. In L. Dirckinck-Holmfeld, C. Jones and B. Lindström, (Eds). *Analysing Networked Learning Practices in Higher Education and Continuing Professional Development*. Rotterdam: Sense Publishers, BV
- Dron, J. (2011). Analogue Literacies. Paper presented at the CODE Symposium, 23rd February 2011, Chiba, Japan. http://www9.code.ouj.ac.jp/sympo-2011/pdf/1_Jon_Dron_11.pdf [Viewed 5th Oct 2011].
- Edwards, P. N. (2003). Infrastructure and modernity: Force, time, and social organization in the history of sociotechnical systems. In T. J. Misa, P. Brey, & A. Feenberg (Eds.), *Modernity and technology* (pp. 185–225). Cambridge MA: MIT Press
- Goodfellow, R. (2010) Literacy, literacies and the digital in higher education. *Teaching in Higher Education*. Vol. 16 (1), 1-14.
- Hanseth, O., & Lundberg, N. (2001). Designing work oriented infrastructures. *Computer Supported Cooperative Work*. Vol 10, 347–372
- Hargittai, E. (2010). Digital Na(t)ives? Variation in Internet Skills and Uses among Members of the “Net Generation”. *Sociological Inquiry*, 80(1), 92-113.
- Jones, C (2012). Networked learning, stepping beyond the Net Generation and Digital Natives. In L. Dirckinck-Holmfeld, V. Hodgson and D. McConnell (Eds). *Exploring the Theory, Pedagogy and Practice of Networked Learning Literacies* (pp 27-41). New York: Springer.
- Jones, C. (2011). Students, the Net Generation and Digital Natives: Accounting for educational change. In Thomas, M (Ed). *Deconstructing Digital Natives: Young People, Technology and the New* (pp 30-45). London & New York: Routledge.
- Jones, C., & Dirckinck-Holmfeld, L. (2009). Analysing Networked Learning Practices: An Introduction. In L. Dirckinck-Holmfeld, C. Jones and B. Lindström, (Eds). *Analysing Networked Learning Practices in Higher Education and Continuing Professional Development* (pp 1-27). Rotterdam: Sense Publishers, BV.
- Jones, C., Ramanau, R., Cross, S.J., and Healing, G. (2010). Net generation or digital natives: Is there a distinct new generation entering university? *Computers & Education*. Vol 54 (3), 722-732.
- Kennedy, G., Judd, T., Dalgarno, B., & Waycott, J. (2010). Beyond natives and immigrants: exploring types of net generation students. *Journal of Computer Assisted Learning*, 26(5), 332-343.
- Mills, K. A. (2010). A Review of the "Digital Turn" in the New Literacy Studies. *Review of Educational Research*, Vol. 80 (2), pp. 246–271.
- Oliver, M. (2011). Technological determinism in educational technology research: some alternative ways of thinking about the relationship between learning and technology. *Journal of Computer Assisted Learning*, 27 (5), 373-384.
- Palfrey, J. and Gasser, U. (2008) *Born Digital: Understanding the First Generation of Digital Natives*. New York: Basic Books.
- Palfrey, J. and Gasser, U. (2011). Reclaiming an Awkward Term: What We Might Learn from "Digital Natives,". In M. Thomas (Ed) *Deconstructing Digital Natives: Young People, Technology and the New Literacies*. London & New York: Routledge.
- Prensky, M. (2001a) Digital natives, digital immigrants. *On the Horizon*. Vol 9(5).
- Prensky, M. (2001b). Digital Natives, Digital Immigrants, part 2: Do they really think differently? *On the Horizon*, 9(6), 6.
- Prensky, M. (2009). H. Sapiens Digital: From Digital Immigrants and Digital Natives to Digital Wisdom. *Journal of Online Education*, 5(3).
- Prensky, M. (2011). Digital Wisdom and Homo Sapiens Digital: From digital immigrants and digital natives to the digitally wise. In M. Thomas (Ed) *Deconstructing Digital Natives: Young People, Technology and the New Literacies*. London & New York: Routledge.
- Selwyn, N. (2010). *Schools and Schooling in the Digital Age: A critical analysis*. London & New York: Routledge.